TULANE STUDIES IN ZOOLOGY AND BOTANY

Volume 19, Numbers 1 and 2 January 31, 1975

A NEW CRAWFISH OF THE GENUS *PROCAMBARUS*, SUBGENUS *CAPILLICAMBARUS*, FROM TEXAS, WITH NOTES ON THE DISTRIBUTION OF THE SUBGENUS

DOUGLAS W. ALBAUGH[1]
Department of Wildlife and Fisheries Sciences,
Texas A & M University, College Station, Texas 77843

Abstract

A new species is described, on the basis of 43 first form males from Brazoria County, Texas. New distributional records for *Procambarus hinei* and *P. incilis*, the other known members of the subgenus, include ten new county records. The ranges suggest that rivers are significant barriers separating these species from one another.

Introduction

The species of *Procambarus* described here occurs in the lower Brazos River valley, between the ranges of *P. hinei* (Ortmann, 1905) and *P. incilis* Penn (1962), the other two known members of the subgenus *Capillicambarus* Hobbs (1972). Collected by the author in the spring of 1972, this crawfish also has been found in collections made in 1966 by Joe B. Black of McNeese State University, Lake Charles, Louisiana.

I wish to thank Dr. Black for very generously providing data on all his Texas collections of the subgenus *Capillicambarus*, and for loaning several of them to me. I am also most grateful to Horton H. Hobbs, Jr. of the Smithsonian Institution for his criticism of the manuscript, and to Chester O. Martin for his assistance in the preparation of the figures. This is contribution No. TA10099 of the Texas Agricultural Experiment Station.

[1] Present address: Department of Biology, George Peabody College, Nashville, Tennessee 37203.

Procambarus (*Capillicambarus*)
brazoriensis new species

Diagnosis.—Body and eyes pigmented. Rostrum usually without marginal spines or tubercles in adults, acumen poorly or not at all delimited basally. Juveniles with acute lateral spines at base of acumen. Areola broad but variable, 2.5 to 4.9 times longer than wide, and 28.3 to 33.6% of entire length of carapace. Single cervical spine present or absent, often so small as to escape notice. Postorbital ridges weakly developed, terminating anteriorly in short spine or ending squarely, with no spine. Antennal scale 2.1 to 2.5 times longer than wide, broadest slightly proximal to midlength. Chela subcylindrical and non-tuberculate. Ischia of third and fourth pereiopods with simple hooks. Venter of cephalothorax covered with dense mat of long hairs arising from mesial faces of pereiopods and third maxillipeds. First pleopods (Fig. 1-A, B) symmetrical, extending forward just beyond caudal margin of coxae of third pereiopods when abdomen is flexed. Apical third of pleopod bent caudad at about 35° angle to shaft, expanding distally as seen in mesial view, not tapering toward apex, terminating abruptly in three small elements. Apical elements twisted (sinistrally on left appendage) as

Editorial Committee for this Paper:

Dr. Horton H. Hobbs, Jr., Senior Zoologist, Department of Invertebrate Zoology, National Museum of Natural History, Washington, D.C. 20506

Dr. J. F. Fitzpatrick, Jr., Associate Professor, Department of Biological Sciences, University of South Alabama, Mobile, Alabama 36608

Table 1. Measurements (mm) of *Procambarus brazoriensis*.

	Holotype	Morphotype	Allotype
Carapace:			
Length	15.2	14.2	17.3
Greatest height	8.3	7.8	9.3
Greatest width	7.6	7.1	9.1
Areola:			
Length	5.1	4.4	5.7
Least width	1.2	1.2	1.4
Rostrum:			
Length	4.1	3.9	5.0
Width at base	2.5	2.4	3.1
Antennal scale:			
Length of lateral margin	4.2	4.0	4.2
Greatest width	1.9	1.7	2.0
Chela:			
Length of outer margin	13.6	9.6	7.3
Length of inner margin of palm	8.4	5.4	3.1
Greatest width of palm	3.0	2.3	2.7
Greatest thickness of palm	2.6	1.8	1.8
Length of dactyl	4.6	3.8	3.6

in other members of subgenus (Penn, 1953, 1962), but twisting slight so that elements best observed in mesial or lateral view. Mesial process non-corneous, spiculiform, extending laterodistad; cephalic process somewhat corneous, lying closely mesiocephalic to mesial process, strongly compressed laterally, tapering gently in mesial view from wide base to blunt or truncate tip; central projection corneous, acute, compressed along longitudinal axis, with fusion line of component elements visible. Caudal process absent. Apical half of pleopod with dense covering of long hairs on mesial surface; cephalomesial shoulder weak.

Holotypic male, Form I.—Cephalothorax (Fig. 1-C, D) subovate. Abdomen narrower and slightly longer than cephalothorax. Greatest width of cephalothorax subequal to height at same level. Areola 4.2 times longer than wide. Rostrum without lateral spines, widest at base, with margins converging as nearly straight lines; no median carina. Suborbital angle slightly greater than right angle. Branchiostegal spine small, acute. Cervical groove interrupted by small lateral spine on each side. Epistome (Fig. 1-H) broader than long, with small spine on anterior margin. Cephalic portion of telson with two spines at each caudolateral angle, more lateral one nearly twice length of other. Antennules of usual form, with basal segment bearing large spine on distal margin of ventral surface. Antennae reaching just beyond telson. Antennal scale (Fig. 1-I) extending well beyond tip of rostrum, broadest slightly proximal to midlength; lateral margin straight, terminating in acute spine.

Chela (Fig. 1-E) very finely pubescent. Palm inflated; both fingers terminating in corneous tips. Opposable margins of fingers flattened, covered with rows of minute rounded denticles, with about four rows distally to about ten proximally. Fingers short; length of dactyl 34% that of outer margin of chela. Carpus subcylindrical, nontuberculate.

Hooks on ischia of fourth pereiopods about one-third as long as those on third pereiopods (Fig. 1-J). Hook on latter extending proximally beyond distal margin of corresponding basis; that on fourth pereiopod not reaching proximal margin of ischium.

Hairs on venter of cephalothorax especially thick and conspicuous on mesial faces of third maxillipeds and first three pereiopods.

First pleopods as described in diagnosis. Measurements are given in Table 1.

Morphotypic male, Form II.—Similar to

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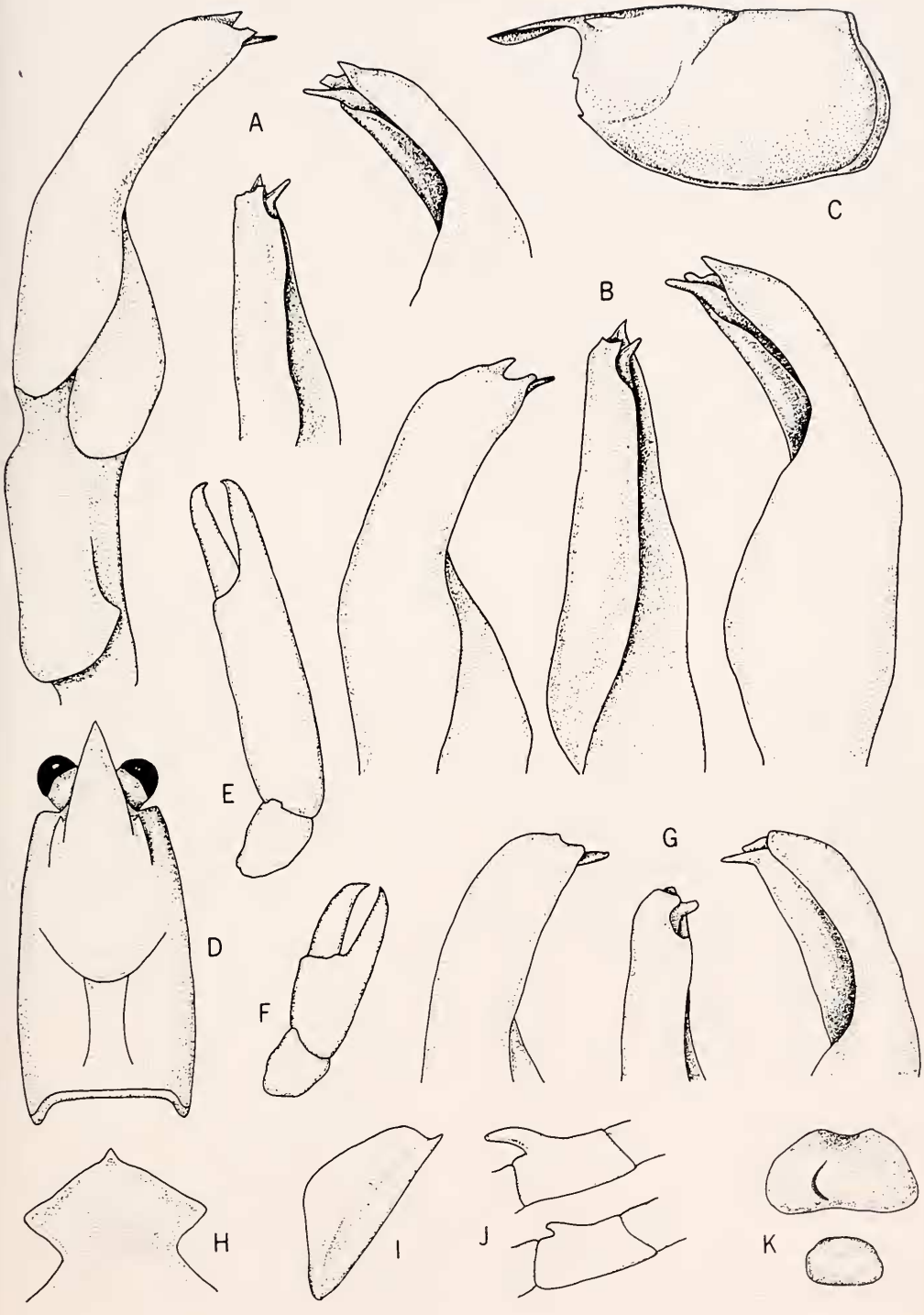
Figure 1. *Procambarus* (*Capillicambarus*) *brazoriensis* new species. A, mesial, caudal, and lateral views (left to right) of first pleopod of paratypic male, Form I; B, similar views of first pleopod of another paratypic male, Form I; C, D, lateral and dorsal views of carapace of holotype; E, chela and carpus of holotype; F, chela and carpus of allotype; G, mesial, caudal, and lateral views of first pleopod of paratypic male, Form II; H, I, epistome and antennal scale of paratypic male, Form I; J, ischia of third and fourth pereiopods of holotype; K, annulus ventralis of paratypic female. Pubescence removed from all structures illustrated.


A
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holotype in general appearance. Chelae reduced but with ratio of finger length to total length of chela as in holotype. Hooks on ischia of third and fourth pereiopods greatly reduced; those on third pereiopods extending proximally barely to margin of ischium, and those on fourth pereiopods appearing only as low prominences. Venter of cephalothorax only sparsely clothed with long hairs. Apical processes of first pleopods (Fig. 1-G) reduced, non-corneous.

Allotypic female.—Similar to holotype in shape and structure of cephalothorax, but differing markedly in proportions of chela (Fig. 1-F), in which length of inner margin of palm and of dactyl subequal. Annulus ventralis (Fig. 1-K) freely movable; width nearly twice as great as length. Annulus in caudal view tapering steeply to truncate apex. Anterior face with deep furrow from base to summit. Sinus originating at summit, running posterodextrad and gently recurving posterosinistrad nearly to base of posterior face. Sternal plate immediately caudal to annulus with acute apex directed cephaloventrad.

Color pattern.—The following notes are based on live and freshly killed specimens. A pair of brown to dark olivaceous dorsal stripes, each slightly wider than the areola, originate behind the eyes and run posteriorly along either side of the areola and onto the abdomen. On the abdomen, these stripes converge slightly, become narrower, and terminate on the base of the telson. The mid-dorsal region, from rostrum to base of telson, is light tan, appearing as a light stripe narrower than the darker stripes bordering it. Another dark stripe, generally brown and narrower than the first, begins on the mid-lateral surface of the carapace and extends to the base of the uropod. The space between this stripe and the edge of the abdominal tergites is about as wide as the stripe. The latter areas, and the broader regions between dorsal and lateral dark stripes, are light tan to pale olive, as are the telson, uropods, and chelae.

Size.—The largest specimen collected is a female, 19.4 mm in carapace length. The largest and smallest Form I males have corresponding lengths of 18.0 and 12.0 mm.

Type locality.—Ditch beside County Road 400, 0.1 mile SE of Missouri Pacific railroad and 0.25 mile SW of Brazos River, at S edge of Brazoria, Brazoria County, Texas. Specimens were netted from the ditch, which lies between the gravel road and a grazed live oak woodland with lush undergrowth. A portion of the ditch over a hundred meters long and about one meter wide commonly contains water up to 0.3 m deep, but dries completely during extended periods without rain. *Procambarus acutus* (Girard, 1852), *P. clarki* (Girard, 1852), and *Cambarellus puer* Hobbs (1945) were collected at the same locality.

Types.—The holotypic male, Form I, allotypic female, and morphotypic male, Form II (Nos. 133916, 133917, 133918, respectively) are deposited together with 50 paratypes (15 ♂ I, 12 ♂ II, 10 ♀, 6 juv. ♂, 7 juv. ♀) in the National Museum of Natural History, Smithsonian Institution. The remaining paratypes (27 ♂ I, 33 ♂ II, 56 ♀, 81 juv. ♂, 88 juv. ♀) are in the collection of the author.

Range.—Procambarus brazoriensis has been found only in Brazoria County, Texas, in an area between the San Bernard River and Oyster Creek (both sides of the Brazos River), extending inland from the Gulf only about 20 miles (Fig. 2). It has been collected by the author or by J. B. Black at the following localities: S edge of Brazoria (DWA T14-1), 1 mi. NE Brazoria (JBB 144, 145; DWA 415), 4.3 mi. NE Brazoria (DWA 408), 5 mi. NE Brazoria (JBB 143), 2.5 mi. S Brazoria (DWA T14-5), and 1.5 mi. N Jones Creek (DWA T14-2).

Variation.—The range of variation in the first pleopods of the 43 Form I males examined is represented in Fig. 1-A, B. Non-secondary sexual characters vary as indicated in the diagnosis. In about 20% of females the annulus ventralis appears as a mirror image of that of the allotype.

Relationships.—Procambarus brazoriensis has its closest affinities with *P. hinei*. In comparison with *P. incilis*, both *P. hinei* and *P. brazoriensis* have a more slender mesial process, a much better developed cephalic process, and a more acute central projection. The hooks on the ischia of the fourth pereiopods of *P. brazoriensis* are similar to those of *P. hinei*, and are much better developed than those of *P. incilis*. These similarities and differences indicate that *P. brazoriensis* is not an intergrade between

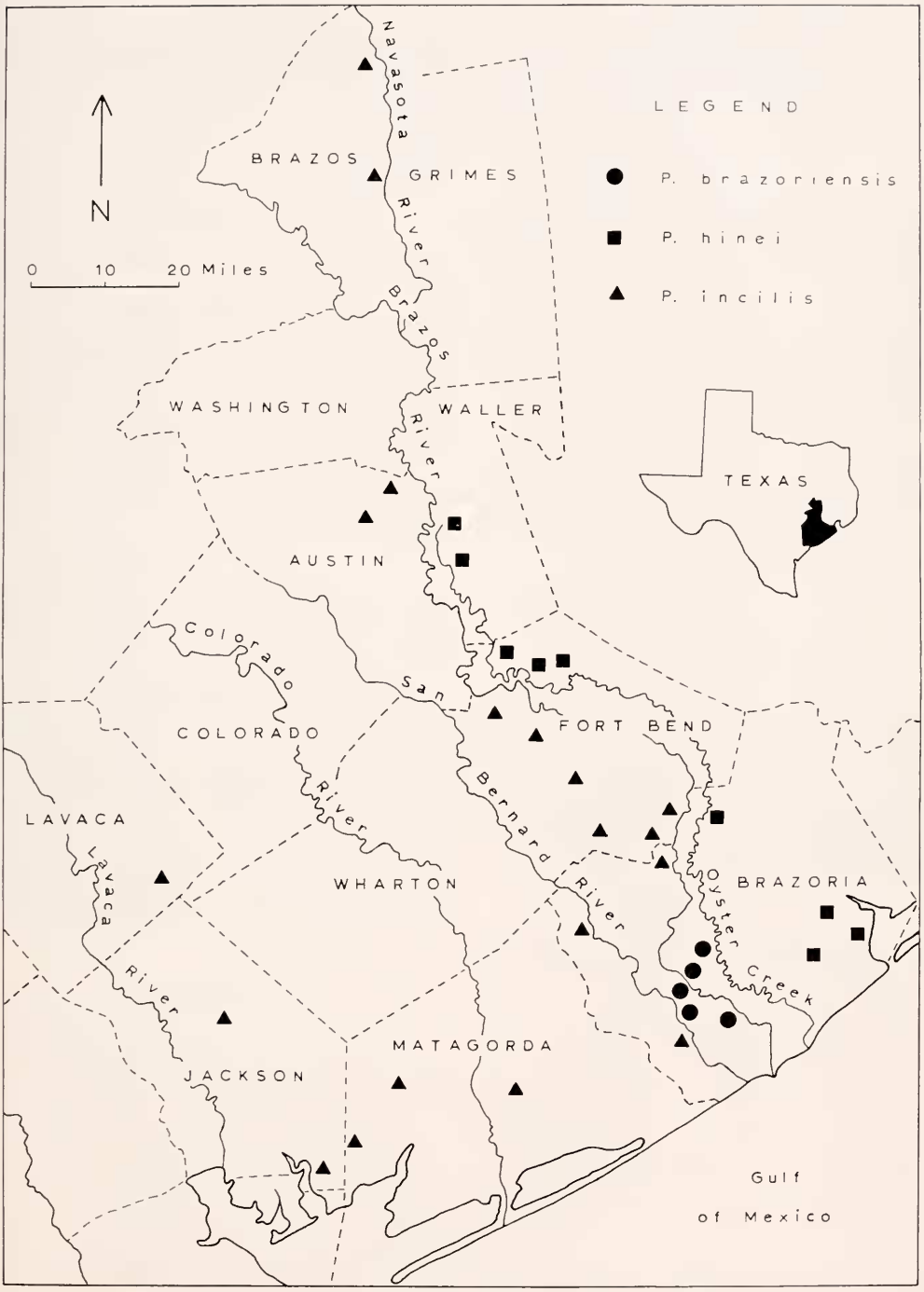

Figure 2. New distributional records for *Procambarus*, subgenus *Capillicambarus*, in Texas (eastern localities for *P. hinei* not included).

P. hinei and *P. incilis*, as might be suggested by its occurrence between the ranges of the latter two species. The annuli ventrales of females of the three species are virtually indistinguishable. Statements that *P. hinei* and *P. incilis* have immovable annuli ventrales (Penn, 1953, 1962) are erroneous.

Procambarus brazoriensis differs from *P. hinei* in having the apical third of the pleopod expanding distally in mesial view and ending abruptly, not tapering to its apex as in *P. hinei*. The cephalic process is wider than that of *P. hinei* both at the base and at its truncate tip, and lies in a more nearly longitudinal plane (with respect to the axis of the animal). The cephalic process of *P. hinei* is nearly transverse in orientation.

Life history notes.—Form I males have been present in every month for which collections are available: March, June, July, August, and September. Large numbers of small young were present in June. Females had sperm plugs in March and August.

Distribution of *Procambarus hinei* (Ortmann)

This species has a spotty distribution throughout most of Louisiana west of the Mississippi River, and in the southeastern corner of Texas. Penn (1956) recorded it from 12 parishes in Louisiana. Previous Texas records are from Harris, Liberty, and Jefferson Counties (Penn and Hobbs, 1958). I have collected it at 16 localities in Texas, as far west as the Brazos River (Fig. 2).

Collection Localities: Brazoria County—2.3 mi. W Rosharon (DWA T12-5), 5 mi. S Danbury (DWA 438), 6.5 mi. SE Danbury (DWA T13-5), 11 mi. SE Danbury (DWA 362); Fort Bend County—2 mi. NW Fulshear (DWA T9-1), 1.6 mi. E Fulshear (DWA T9-7), 5.3 mi. E Fulshear (DWA 432); Jasper County—6 mi. S Evadale (DWA 398); Liberty County—4.8 mi. NW Moss Hill (DWA 403), 0.7 mi. W Moss Hill (DWA 402), 2 mi. E Liberty (DWA 404), 3.3 mi. N Hull (DWA 401); Newton County—15 mi. N Deweyville (DWA 396), 7.8 mi. N Deweyville (DWA 395); and Waller County—9 mi. SSE Hempstead (DWA T7-2), 11 mi. NNW Brookshire (DWA T7-3, T7-4, T7-6).

One of J. B. Black's collections (JBB 145, 1 mi. NE Brazoria, Brazoria County) from the range of *P. brazoriensis* contains a single first form male *P. hinei* in addition to several *P. brazoriensis*. Sympatric occurrence of the two species would be quite significant. However, subsequent collecting at that locality has produced only *P. brazoriensis*, and I am reluctant to accept a record based on one specimen, fearing the possibility of error.

Distribution of *Procambarus incilis* Penn

Previously recorded from Jackson, Matagorda, and Wharton Counties, Texas (Penn, 1962). These localities, and more recent additional collecting, suggest that its range (Fig. 2) is bounded on the southwest by the Lavaca River and Bay. To the east, it appears to be separated from *P. brazoriensis* by the lower San Bernard River, and from *P. hinei* by the Brazos River north almost to its confluence with the Navasota River. *P. incilis* has been collected by the author or by J. B. Black at 19 localities.

Collection Localities: Austin County—3.8 mi. NE Belleville (DWA T8-1), 7.8 mi. NE Belleville (DWA T8-4); Brazoria County—1.7 mi. E Danciger (DWA 418), 7 mi. E Damon (DWA 410), 7 mi. S Brazoria (DWA T14-3); Brazos County—7 mi. NE Kurten (DWA 383), 8 mi. E College Station (DWA T4-2, T4-4); Fort Bend County—10.5 mi. W Rosenberg (DWA T10-5), 4.5 mi. W Rosenberg (DWA T10-2), 7 mi. S Rosenberg (DWA 431), 6.3 mi. E Needville (DWA T11-1), 13.5 mi. ESE Needville (DWA T11-5), 15.5 mi. E Needville (DWA T11-2); Jackson County—5 mi. NE Edna (JBB 421), 8.5 mi. W Palacios (JBB 153); Lavaca County—4 mi. N Speaks (DWA 437); and Matagorda County—8 mi. NW Palacios (DWA T16-6), 1.5 mi. E Blessing (DWA T16-5), 3 mi. N Wadsworth (DWA T15-7).

Zoogeography

The range of *Procambarus brazoriensis* appears to be separated from that of *P. incilis* to the southwest by the San Bernard River, and from that of *P. hinei* to the northeast by Oyster Creek (Fig. 2). Extensive collecting around the periphery of the range has failed to disclose intergrades, or to close the gap between *P. brazoriensis* and its relatives to the north and northwest. The single record of *P. hinei* occurring together with *P. brazoriensis* may be indicative of a sparse population of *P. hinei* existing sympatrically with *P. brazoriensis*, attesting their specific status relative to one another.

The present delimitation of the range

largely by rivers might suggest that these streams isolated a segment of the parental stock, which diverged to become *P. brazoriensis*. However, the geological events leading to the present situation are much too recent for such an explanation to be tenable. This area lies on the Brazos-Colorado alluvial plain, which is of Recent origin. Development of the Oyster Creek course, formerly occupied by the Brazos River, and establishment of the modern lower Brazos have occurred in the last 2,000–4,000 years (Bernard, LeBlanc, and Major, 1962). Late in the Pleistocene the lower Brazos lay west of its present course.

Major rivers may have been important in the derivation of *P. brazoriensis*, but probably it formerly occupied a larger range. Later changes in stream courses may have divided its range, with isolated populations subsequently becoming extinct. A possible explanation for the loss of such populations is the disappearance of barriers separating them from their close relatives, with which they were unable to compete or into the populations of which they were assimilated (if capable of interbreeding). Perhaps survival of members of the subgenus continues to depend, to a degree, on the partial isolation from one another afforded by the rivers separating their ranges.

Further evidence that *P. brazoriensis* was derived from *P. hinei* (or vice versa) rather than from *P. incillis* can be seen in the distribution of the small crawfish, *Cambarellus puer*. *C. puer* occurs together with *P. brazoriensis* and *P. hinei* throughout their ranges, but is not found in the range of *P. incilis* (with two known exceptions in Brazoria County, both localities probably recently colonized).

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